MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

BMT1014 –MANAGERIAL MATHEMATICS

(All sections / Groups)

01 MARCH 2017
2.30 p.m - 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of **5 pages** including cover page and mathematical formulas with **4 Questions** only.

2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.

3. The candidate is allowed to use scientific calculators that are permitted to be used in the examination.

Question 1 (25 marks)

(a) Solve the quadratic-form equation $\frac{1}{x^4} - \frac{9}{x^2} + 8 = 0$.

[6 marks]

(b) Solve $\sqrt{x} - \sqrt{3x+1} + 1 = 0$.

[6 marks]

(c) Determine the slopes of the following lines and then determine whether they are parallel, perpendicular, or neither.

$$2x + 7y - 4 = 0, \qquad 6x + 21y = 90.$$

[6 marks]

(d) The demand function for an office supply company's line of computers is $p = 0.85 - 0.00045q$, where p is the price per unit when q units are demanded by consumers. Find the level of production that will maximize the manufacturer's **total revenue**, and then determine this revenue (*revenue=pq*).

[7 marks]

Question 2 (25 marks)

(a) *Maximize* the profit function $P = 5x + 7y$

subject to the constraints

$$\begin{aligned} 2x + 3y &\leq 45 \\ x - 3y &\geq 2 \\ x, y &\geq 0 \end{aligned}$$

Sketch the inequality region.

[12 marks]

(b) A nutritionist is planning to prepare budget diets for a few families. Says a diet is to contain at least 16 units of carbohydrates and 20 units of protein. Food set A contains 2 units carbohydrates and 4 of protein; food set B contains 2 units of carbohydrates and 1 of protein. If food set A costs RM1.20 per unit and food set B costs RM0.80 per unit, *how many units of each food* should be prepared in order to *minimize cost* and what is the *minimum cost*.

[13 marks]

Continued...

Question 3 (25 marks)

(a) A debt of RM1500 due in **five years** and RM2000 due in **seven years** is to be repaid by a payment of RM2000 now and a second payment at the end of **three years**. How much should the second payment be if interest is at 3% compounded annually?

[7 marks]

(b) For an interest rate of **4%** compounded monthly, find the present value of an annuity of RM150 at the end of each month for **eight** months and RM175 thereafter at the end of each month for a further **two years**.

[6 marks]

(c) A trust fund is being set up by a single payment so that at the **end of 30 years** there will be $50,000 in the fund. If interest is compounded continuously at an **annual rate of 6%**, how much money should be paid into the fund initially?

[6 marks]

(d) In 10 years, a $40,000 machine will have a **salvage value of $4000**. A new machine at that time is expected to sell for $52,000. In order to provide funds for the difference between the replacement cost and the salvage value, a sinking fund is set up into which equal payments are placed at the end of each year. If the fund earns **7% compounded annually**, how much should each payment be?

[6 marks]

Question 4 (25 marks)

(a) Differentiate the following functions using *product rule* and *quotient rule*

i. $f(x) = (3x - x^2)(3 - x - x^2)$

ii. $f(x) = \frac{5x}{x-1}$

[6 marks]

Continued...

(b) Find an equation of the *tangent line* to the following curve at the indicated point:

$$y = \frac{1 - x^2}{5}; (4, -3)$$

[4 marks]

(c) If $f(x, y) = x^3y^2 + x^2y - x^2y^2$, find $f_{xxy}(2,3)$ and $f_{xyx}(2,3)$.

[3 marks]

(d) Integrate the following functions:

i. $$\int \left(\frac{18x^{10} - 5x^6 + 3x^2}{x^2} \right) dx$$

ii. $$\int_{-2}^{2} (2 - x)\, dx + \int_{2}^{3} \frac{12x}{(x^2 - 2)^2}\, dx$$

[6 marks]

(e) Find the area of the region bounded by $y = 10 - x^2$ and $y = 4$.

[6 marks]

End of Page.

Summary of Principal Formulas and Terms

Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)

(ii) Accumulated amount, $A = P(1 + rt)$

Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i = \frac{r}{m}$, and $n = mt$

(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

Effective Rate of Interest

$$r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$$

Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$ (R = periodic payment required to accumulate S dollars over n periods)